# Project Report: Student Grade Prediction with XGBoost

**Bedo Project – Student Grade Prediction using XGBoost**

## Developed By:


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**Internship Period:** Summer 2025

## Problem Statement

The project aims to predict the final grade of university students based on their academic and behavioral data. Grades range from **A+ to F** and are predicted as a **multi-class classification** task.

## Dataset Overview

- **File Name:** `student_dataset.csv`
- **Shape:** more than 9000 rows × 4 columns (after removing non-useful columns)
- **Source:** kaggle.com
- **Target Variable:** `Grade` (categorical, encoded from A+ to F)

### Grade Encoding:

```
{
    'A+': 0, 'A': 1, 'B+': 2, 'B': 3, 'C': 4, 'D': 5, 'F': 6
}
```

### 🛠️ Model Architecture:

- **Algorithm:** XGBoost Classifier
- **Hyperparameters:**
    - n_estimators = 100
    - max_depth = 6
    - learning_rate = 0.1
    - eval_metric = 'mlogloss'
- **Number of Classes:** 7 (A+ to F)

# Evaluation Results

## File:

`results/results_2025-08-05_23-16-33.csv`

## Accuracy:

**92.94%**

## Classification Metrics:

| Grade | Precision | Recall | F1-Score | Support |
|---|---|---|---|---|
| A+ | 88.89% | 80.00% | 84.21% | 10 |
| A | 85.91% | 84.72% | 85.31% | 72 |
| B+ | 92.46% | 90.64% | 91.54% | 203 |
| B | 91.18% | 92.20% | 91.69% | 359 |
| C | 91.48% | 93.36% | 92.41% | 437 |
| D | 96.67% | 95.33% | 95.99% | 578 |
| F | 91.55% | 92.20% | 91.87% | 141 |

## Macro Average:

- Precision: 91.16%
- Recall: 89.77%
- F1-Score: 90.43%

## Weighted Average:

- Precision: 92.97%
- Recall: 92.94%
- F1-Score: 92.95%

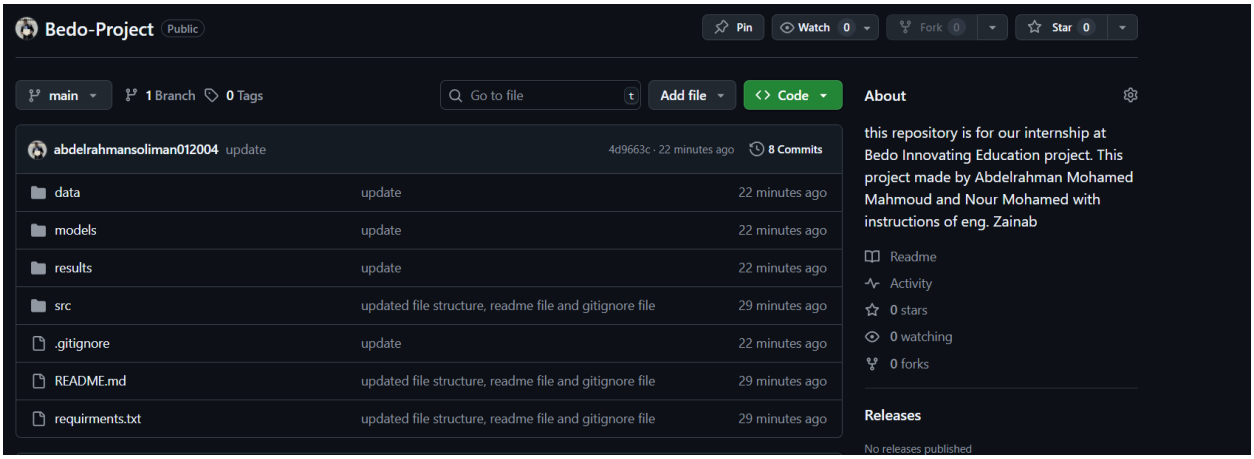
## Screenshots:

### *Our output*

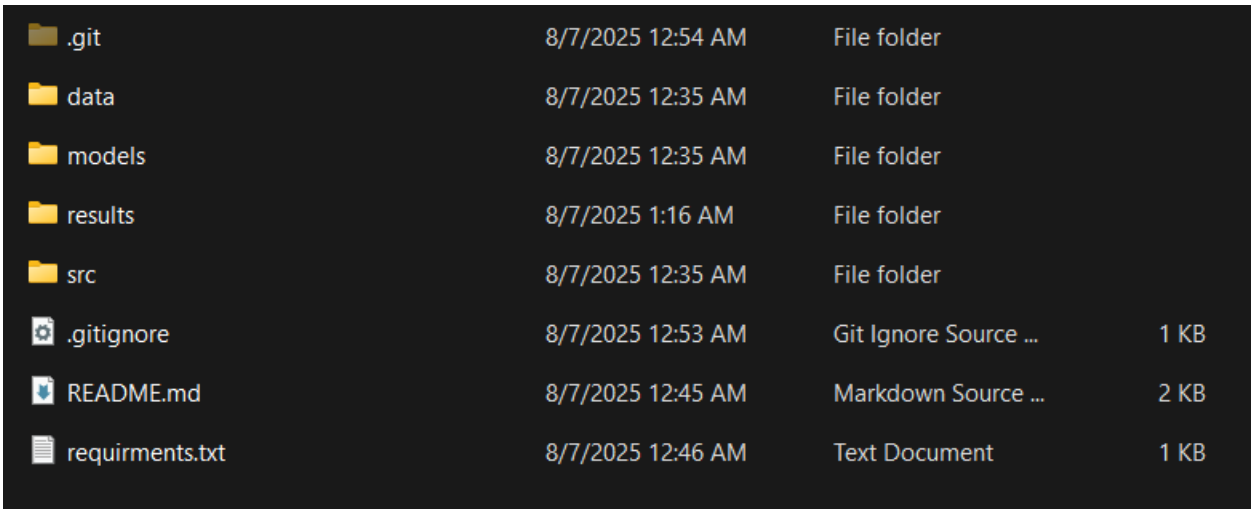
```
/python_script.py"

Results saved to: D:\Bedo project\results\results_2025-08-07_01-16-08.csv
Model saved to: D:\Bedo project\models\xgb_model.pkl
```

### *Our GitHub*

[abdelrahmansoliman012004/Bedo-Project]




### *File structure*




# Conclusion

This project successfully trained a robust XGBoost classifier to predict student grades with an accuracy of **92.94%**, using academic and behavioral data. The system can serve as a foundation for academic support tools that proactively identify struggling students.